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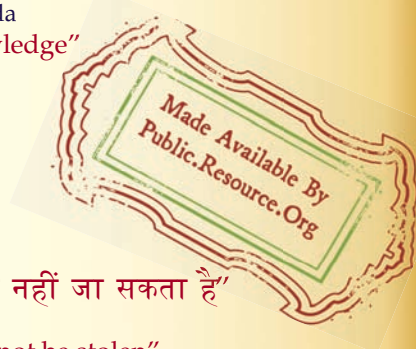
IS 13214 (1991): Machine tools - Ergonomics anthropometric terminology [PGD 15: Ergonomics]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

मशीनी औज़ार — अर्गोनॉमिक्स मानवमीटरी शब्दावली

Indian Standard

**MACHINE TOOLS—ERGONOMICS
ANTHROPOMETRIC TERMINOLOGY**

UDC 621.9 : 001.4 : 65.015.11 : 572.087

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 7

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Machine Tools Basic and Modular Units Sectional Committee had been approved by the Production Engineering Division Council.

Anthropometry is the subject which is concerned with human body measurements. Such body measurements include body dimensions, range of motion and muscle strength. To ensure man-machine compatibility, it is essential to use the anthropometric data of the user population in the design of the machine tools.

The basic list specified in this standard is intended to serve as a guide for ergonomists who are required to define population group and apply their knowledge to the geometric design of the equipment places where people work and live. This standard may be used in conjunction with national regulations or agreements to assure harmony in defining population groups.

This standard contains static measurements only. Dynamic measurements are not covered here. Efforts are, however, being made to collect data on dynamic measurements.

While preparing this standard, considerable assistance has been taken from data supplied by different ergonomic institution and ISO/DIS 7250 'Basic list of anthropometric measurements', issued by the International Organization for Standardization (ISO).

Indian Standard

MACHINE TOOLS — ERGONOMICS ANTHROPOMETRIC TERMINOLOGY

1 SCOPE

This standard provides a basic list of anthropometric terminology and measurements for use in the establishment of common comparative definitions of population groups, in machine tool activities.

2 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

2.1 Population Group

A group of people having some common environment or activity. These groups may be as diverse as geographic populations, persons having similar activity or specified groups.

2.1.1 Percentile

Statistics, any of the points dividing a range of data into hundred equal intervals and indicating the percentage of a distribution falling below it.

2.2 Terms Used in Basic List

2.2.1 Anatomical Planes and Orientation

Shall be as given in Fig. 1 of Annex A.

2.2.2 Anatomical and Anthropometric Land Marks

Shall be as given in Fig. 2 of Annex A.

2.2.3 Linkage System in Human Body

Shall be as given in Fig. 3 of Annex A.

2.2.4 Acromion

The most lateral point of the lateral edge of the spine of the scapula.

2.2.5 Phalanges

The bones of the fingers and the toes.

2.2.6 Sagittal

Pertaining to anteroposterior (front to back) median plane of the body, or to plane parallel to the median.

2.2.7 Metacarpal

Pertaining to the long bones of the hand between the carpus (wrist bones) and the phalanges.

3 MEASURING TOOLS

The standard measurement tools which are recommended are the anthropometer, sliding calipers, spreading calipers, scale and tape measure. The anthropometer is a specified tool for measuring linear distances between points on the body and standard reference surfaces such as the floor or a seat platform. Sliding and spreading calipers are used for measuring the breadth and depth of body segments as well as the distance between body marks. A tape measure is used for measuring body circumferences.

3.1 Measurements may preferably be taken on right-hand-side of the normal subject.

4 BASIC LIST OF ANTHROPOMETRIC TERMINOLOGY

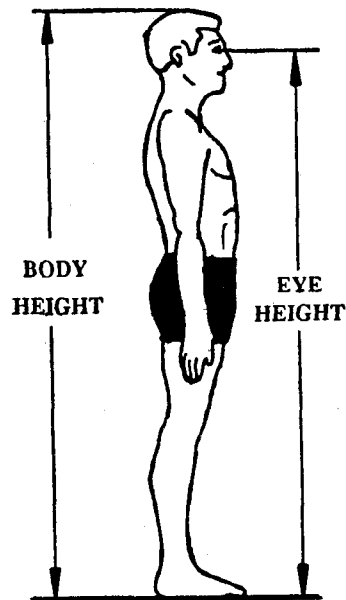
4.1 Standing Posture

4.1.1 Body Height

This is the vertical distance from the floor to the top of the head. The subject stands erect with heels together and looks straight ahead.

4.1.2 Eye Height

This is the vertical distance from the floor to the inner corner of eye. The subject stands erect and look straight ahead.

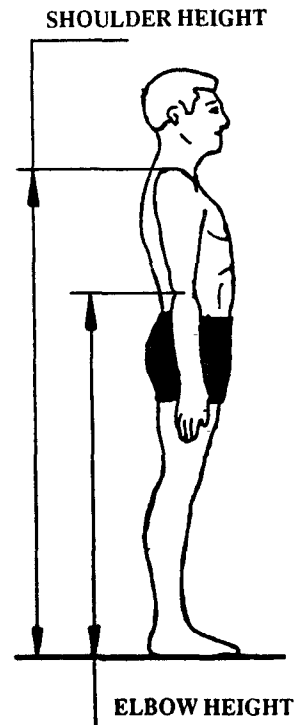


4.1.3 Shoulder Height

This is the vertical distance from the floor to the uppermost point on the lateral edge of the shoulder (*acromion*) with the subject standing erect.

4.1.4 Elbow Height

This is the vertical distance from the floor to the depression at the elbow between the bones of the upper arm and forearm. The subject stands erect with his arms hanging naturally, at his sides.

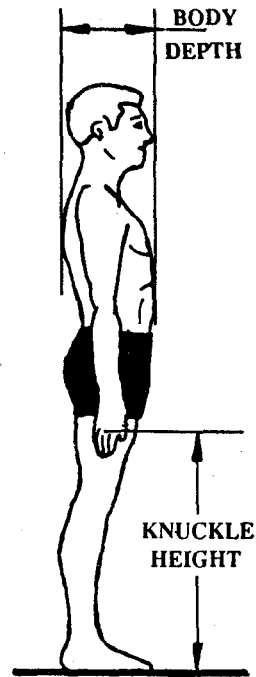


4.1.5 Knuckle Height

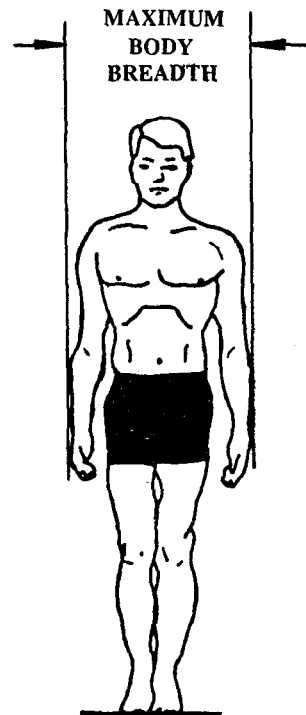
This is the vertical distance from the floor to the point where the middle finger of the right hand meets the palm. The subject stands erect with his palm flat against the side of his thigh.

4.1.6 Maximum Body Depth

This is the maximum horizontal distance between the vertical planes passing through the most anterior and posterior points on the trunk.

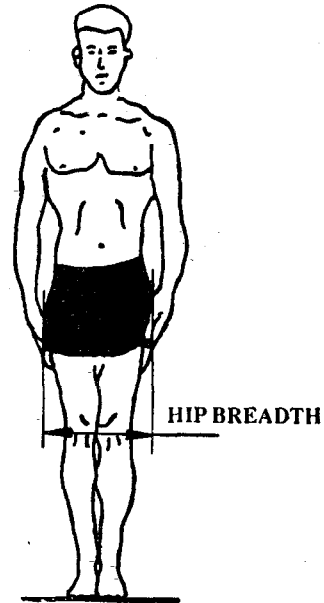
**4.1.7 Maximum Body Breadth**

This is the maximum breadth of the body, including arms with the subject standing erect with his arms tightly pressed against the body with dorsiflexion of the palms.



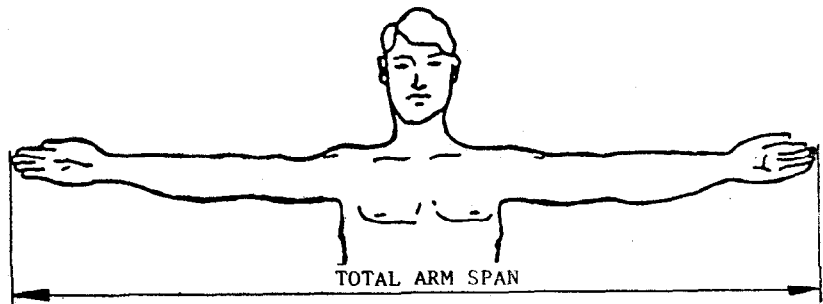
4.1.8 Hip Breadth

This is the maximum horizontal distance across the hips. The subject stands erect with his heels together.



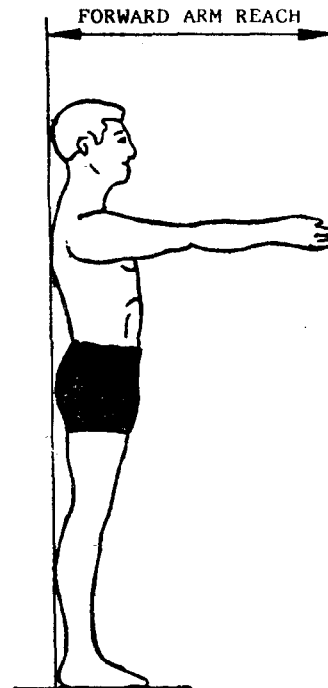
4.1.9 Total Arm Span

This is the maximum horizontal distance across the tips of extended middle fingers with subject standing erect and arms stretched on sides.



4.1.10 Forward Arm Reach

This is the horizontal distance from the posterior surface of the right shoulder to the tip of the extended middle finger. The subject stands erect with heels, buttocks and shoulders against the wall and right arm and hands extended forward horizontally to their maximum length.

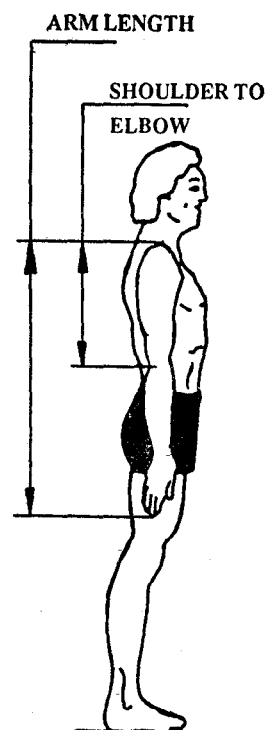


4.1.11 Arm Length

This is the distance from the top of acromion to tip of the extended middle finger. The subject stands erect with his arms by the side of the body.

4.1.12 Shoulder to Elbow

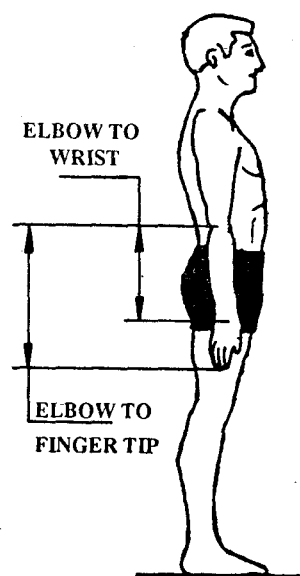
This is the vertical distance from the top of the acromion to the tip of elbow. The subject stands erect with the arms by the side of the body.

**4.1.13 Elbow to Wrist**

This is the distance between the tip of the elbow and the outside projection of the distal end of ulna. The subject stands erect with his arms by the side of the body.

4.1.14 Elbow to Finger Tip

This is the distance between the tip of the elbow and the tip of the extended middle finger. The subject stands erect with his arms by the side of his body.



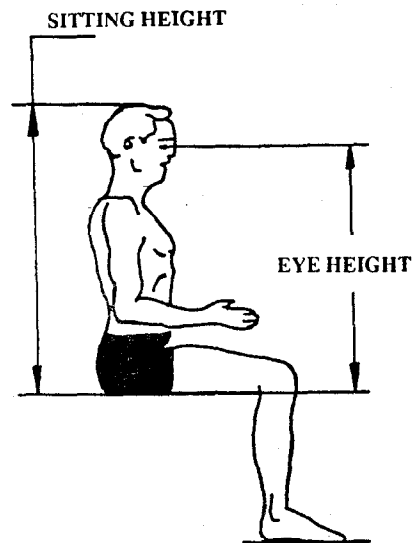
4.2 Sitting Posture

4.2.1 Sitting Height

This is the vertical distance from the sitting surface to the top of the head. The subject sits erect, looks straight ahead with his knees and ankles forming right angles.

4.2.2 Eye Height

This is the vertical distance from the sitting surface to the inner corner of the eye. The subject sits erect and looks straight ahead.

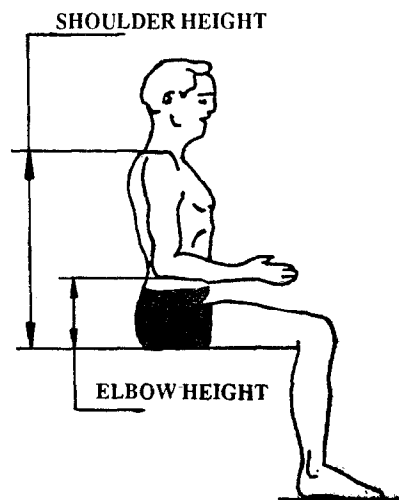


4.2.3 Shoulder Height

This is the vertical distance from the sitting surface to the uppermost point on the lateral edge of the shoulder with the subject sitting erect.

4.2.4 Elbow Height

This is the vertical distance from the sitting surface to the bottom of the right elbow. The subject sits erect with his upper arm vertical at his side and his forearm at a right angle to the upper arm.

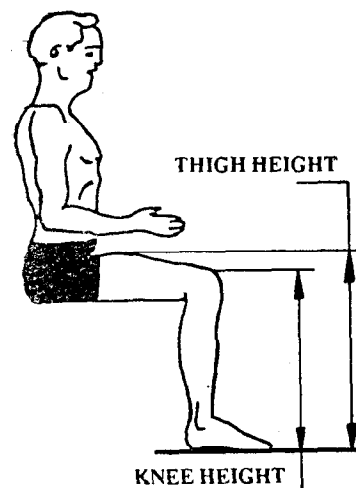


4.2.5 Knee Height

This is the vertical distance from floor to uppermost point of the knee (top of muscle mass near lower end of femur). The subject sits erect with knees and ankles at right angles.

4.2.6 Thigh Height

This is the vertical distance from the floor to the top of the thigh at its intersection with the abdomen. The subject sits erect with his knees and ankles at right angles.

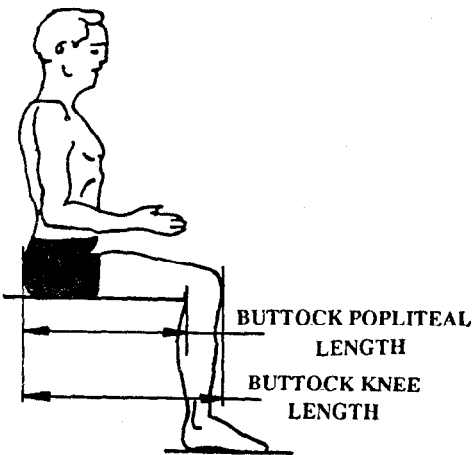


4.2.7 Buttock Knee Length

This is the horizontal distance from the most posterior point on the buttocks to the most anterior point on the knee. The subject sits erect with his knees and ankles at right angles.

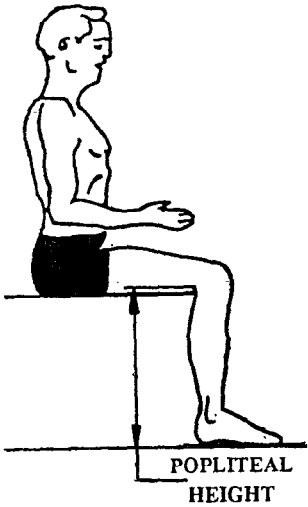
4.2.8 Buttock Popliteal Length

This is the horizontal distance from the plane of the most posterior point on the buttocks to the back of the lower leg at knee. The subject sits erect with his knees and ankles at right angles.



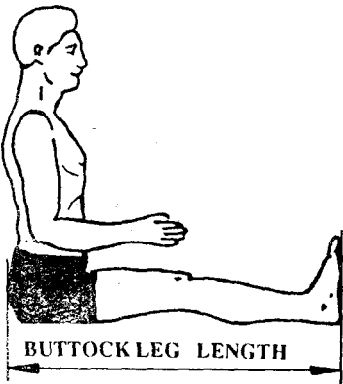
4.2.9 Popliteal Height

This is the vertical distance from floor to the underside of the thigh immediately behind knee. The subject sits erect with his knees and ankles at right angles and the bottom of his thighs and the back of his knees barely touching the sitting surface.



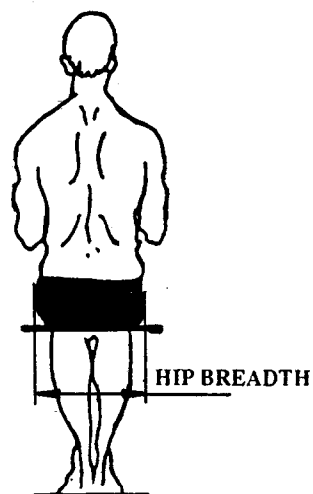
4.2.10 Buttockleg Length

This is the horizontal distance from the most posterior point on the buttocks to the base of the heel. The subject sits erect with his legs as forward as possible on a horizontal surface.



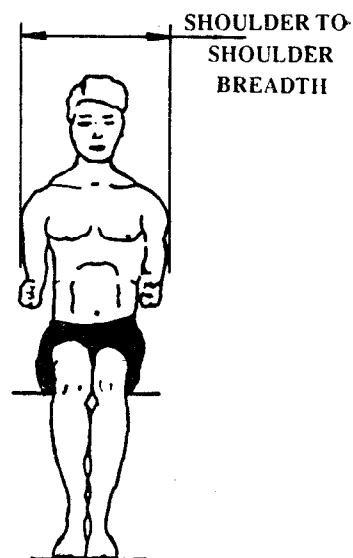
4.2.11 Hip Breadth

This is the maximum horizontal distance across the hips. The subject sits erect with his knees and ankles right at angles and his knees and heels together.



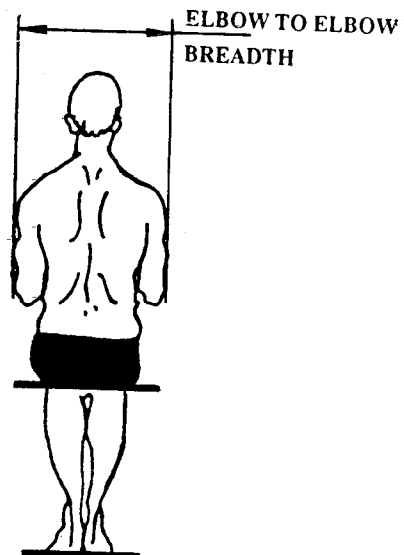
4.2.12 Shoulder to Shoulder Breadth

This is the maximum horizontal distance across the deltoid muscles. The subject sits erect with his upper arms touching his sides and his forearms extended horizontally.



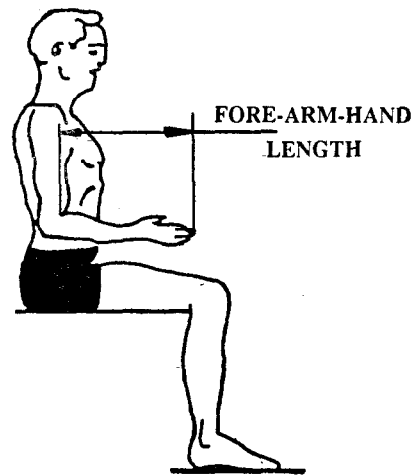
4.2.13 Elbow to Elbow Breadth

This is the maximum horizontal distance across the lateral surface of the elbows. The subject sits erect with his upper arms vertical and touching his sides and his forearms extended horizontally.



4.2.14 Fore-Arm-Hand Length

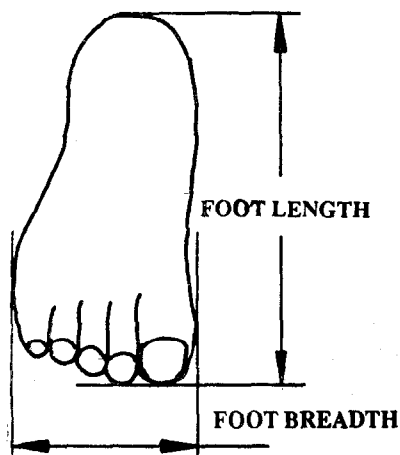
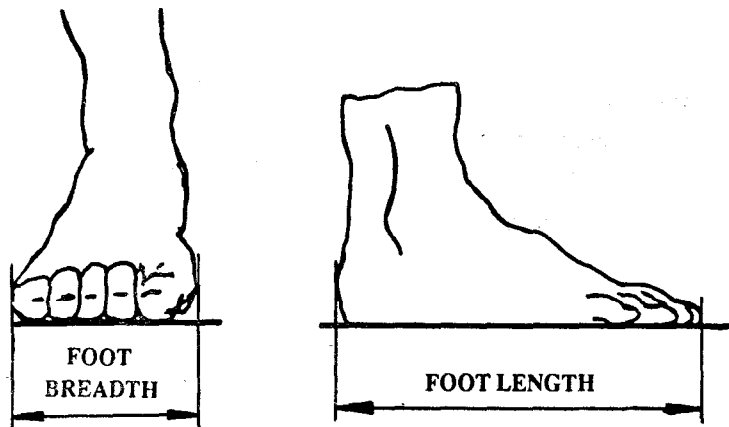
This is the horizontal distance from the tip of the right elbow to the tip of middle finger. The subject sits erect with his upper arm vertical at his side and his forearm, hand and fingers extended horizontally.

**4.3 Foot Length**

This is the horizontal distance from the back of the heel to the tip of the longest toe. The subject stands with his weight equally distributed on the both feet.

4.4 Foot Breadth

This is the maximum horizontal distance across the foot at right angles to the long axis.

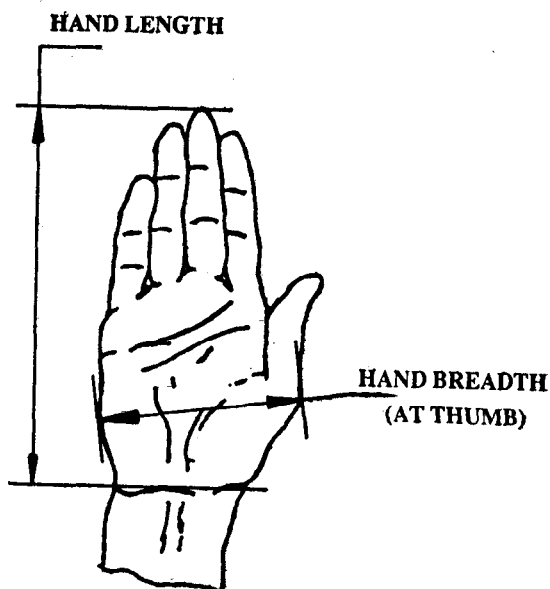


4.5 Hand Length

Distance from end of small wrist bone at base of thumb to tip of middle finger of right hand when the palm is up with fingers extended and together.

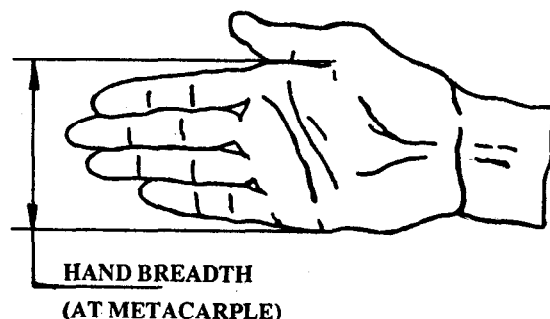
4.6 Hand Breadth (At Thumb)

This is the maximum breadth across the plane (at right angles to the long axis of the hand) at the knuckle of the thumb of the right hand with the fingers extended and the thumb lying along side and the plane of the hand.



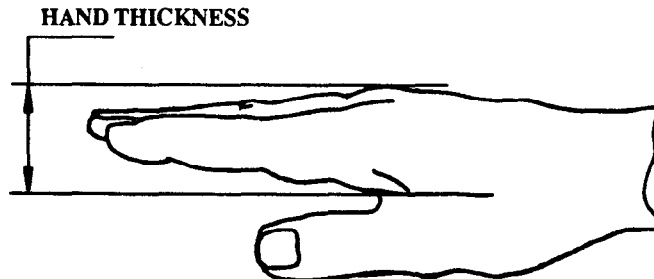
4.7 Hand Breadth (At Metacarpale)

This is the maximum breadth across the ends of metacarpal bones (where the fingers join the palm) of the index and little fingers of the right hand held straight and stiff with the finger together.



4.8 Hand Thickness

This is the maximum distance between the dorsal and palmier surfaces of the knuckle of the middle finger where it joins the palm of the right hand when the fingers are extended.



4.9 Index Finger Length

The distance from the tip of the second finger to the proximal skin furrow of the joint between proximal phalange and metacarpal.

4.10 Index Finger Breadth, Proximal

The maximum distance between the medial and lateral of the second finger in the region of the joint between medial and proximal phalanges.

4.11 Waist Height (Trochanteric Height)

Vertical height of the waist (trochanteric protuberation) that is, from the hip bones to floor.

ANNEX A

(Clauses 2.2.1, 2.2.2 and 2.2.3)

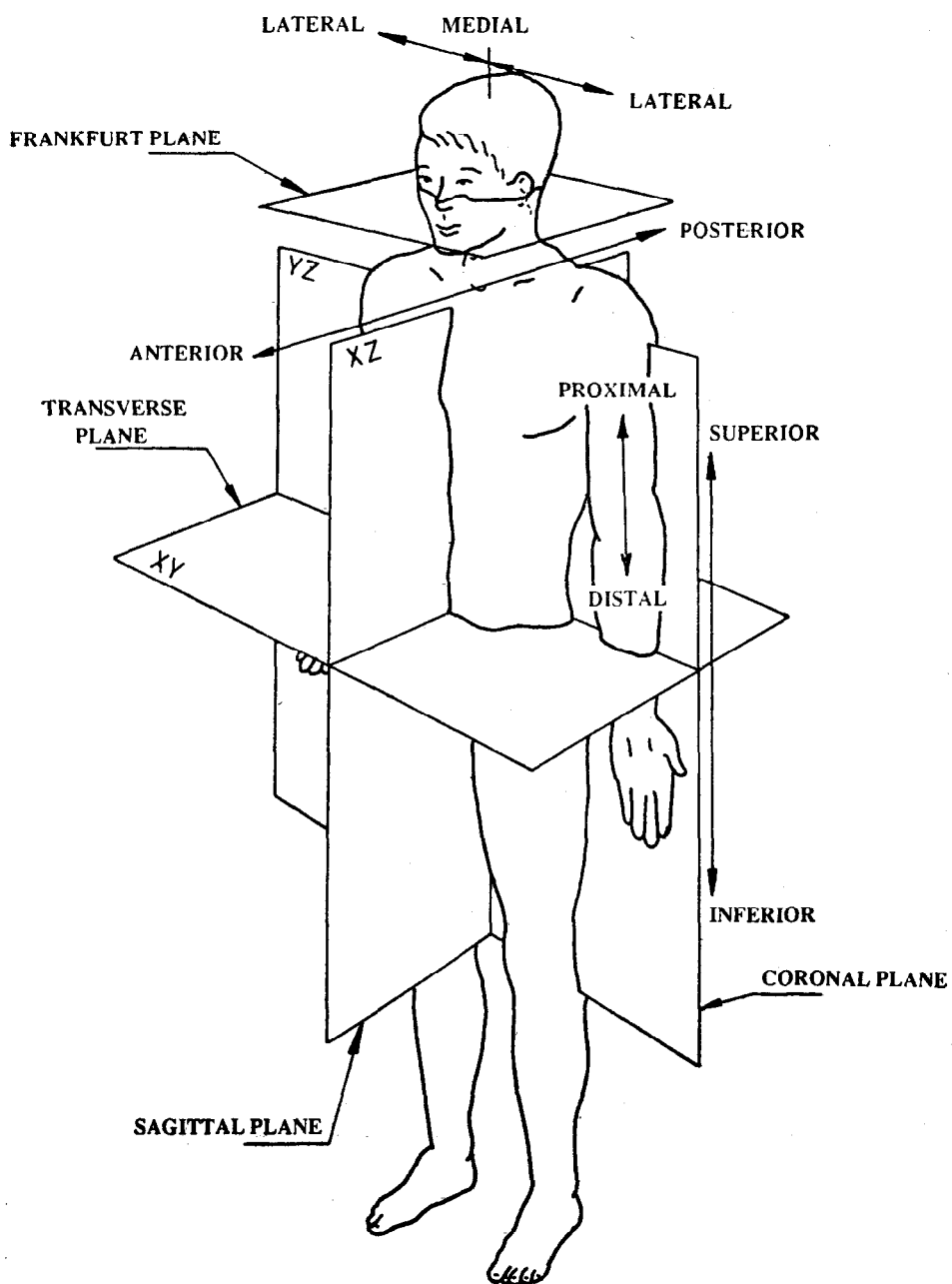


FIG. 1 ANATOMICAL PLANES AND ORIENTATIONS

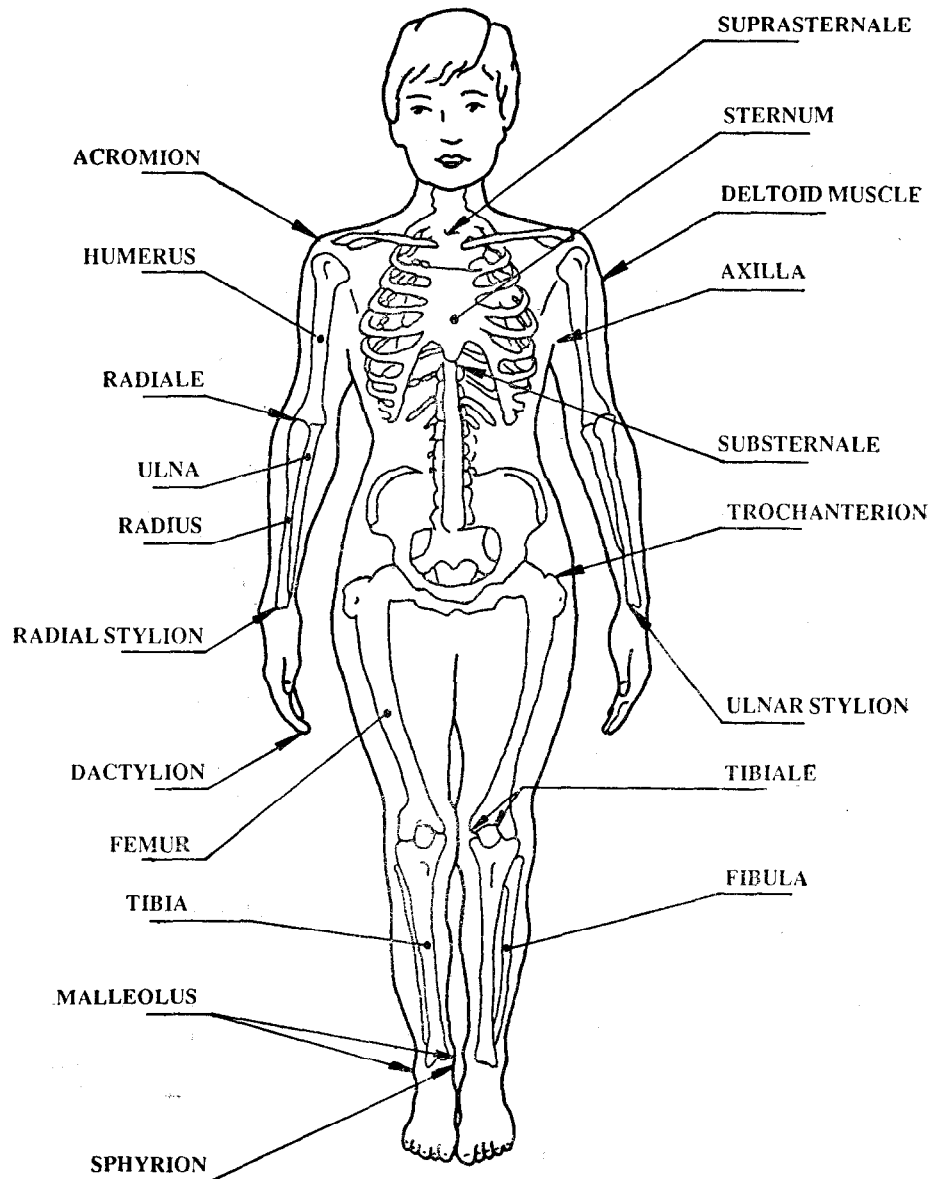


FIG. 2 ANATOMICAL AND ANTHROPOMETRIC LAND MARKS

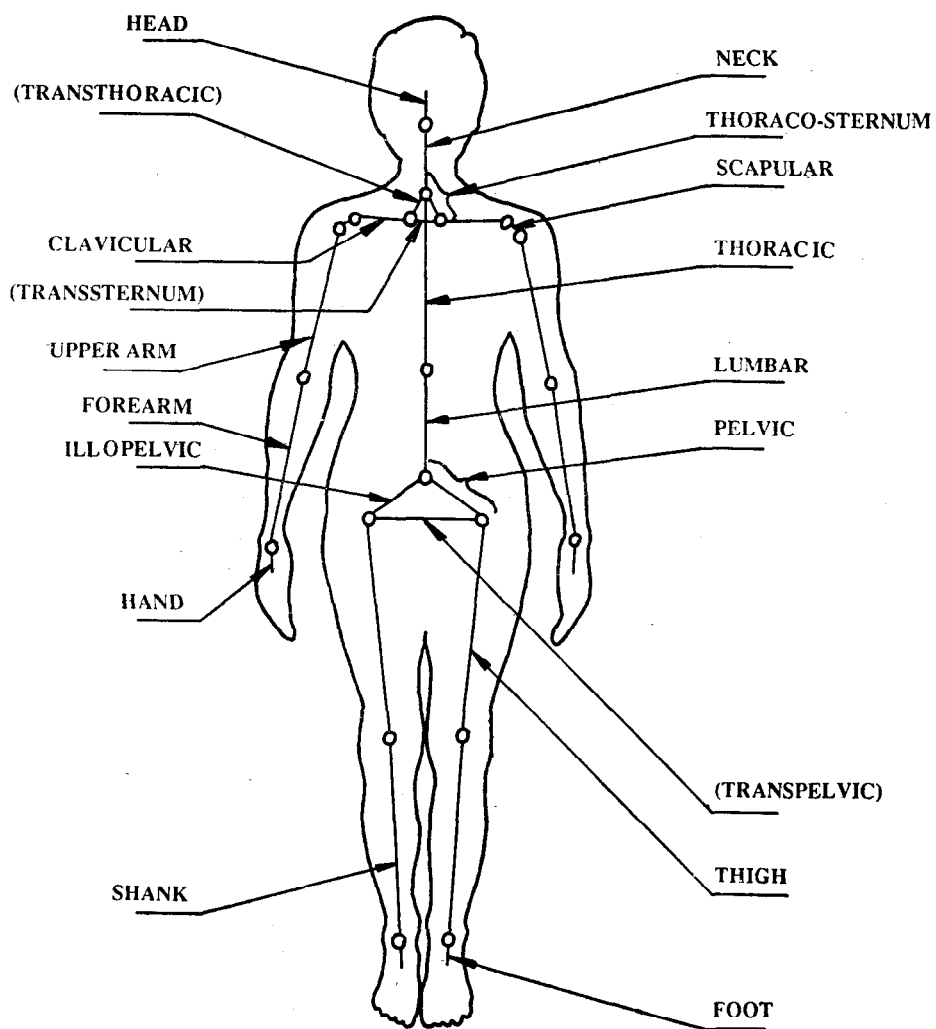


FIG. 3 LINKAGE SYSTEM IN HUMAN BODY

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